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wherein the distortion corrected by the diffractive field mirror is an off-centering distortion of the second kind corresponding to an absence of symmetry of revolution caused by the spherical concave mirror being viewed at an oblique angle with respect to an axis of the spherical concave mirror

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 14-26 are pending in the present application with Claim 14 having been amended by the present amendment.

In the outstanding Office Action, Claim 24 was objected to; Claims 14-16, 20 and 24-26 were rejected under 35 U.S.C. § 102(b) as anticipated by Wood; Claims 17-19 were rejected under 35 U.S.C. § 103(a) as unpatentable over Wood in view of Chen et al; and Claim 22³ was indicated as allowable if rewritten in independent form.

Applicants thank the Examiner for the indication of allowable subject matter.

Regarding the objection to Claim 24, the outstanding Office Action indicates the phrase "the second intermediate image" lacks proper antecedent basis. However, Applicants note Claim 24 depends on Claim 23, and that Claim 23 recites "a second intermediate image." Thus, the phrase "the second intermediate image" recited in Claim 24 has proper antecedent basis. Accordingly, it is respectfully requested this objection be withdrawn.

Claims 14-16, 20 and 24-26 stand rejected under 35 U.S.C. § 102(b) as anticipated by Wood. This rejection is respectfully traversed.

In the previous response filed June 27, 2002, Applicants presented an argument that in Wood, the diffractive field mirror corrects optical aberrations, not distortions. In more

detail, the word "aberrations" which is used in column 3, line 30, means optical aberrations. In fact, column 3, lines 22-23, states "(this positioning) produces optical aberrations, particularly when a large pupil and a large field of view are desired." Optical aberrations include spherical aberrations, coma and astigmatism. Distortion is not an optical aberration, but is an image aberration. It is a geometrical flaw (deformation of the shapes) not a resolution flaw (optical quality of the image). The size of the pupil has no effect on distortion (but it has an effect on optical aberrations).

Regarding these arguments, the outstanding Office Action indicates the terms "aberration" and "distortion" are equivalent and that the Applicant's specification uses the term "off-centering aberration" and "off-centering distortion" interchangeably.

However, Applicants note the terms "aberration" and "distortion" are not equivalent and that the terms in the specification are not used interchangeably, but rather describe two separate distinct characteristics. That is, as disclosed in the specification at page 2, line 35 to page 3, line 7, "[to] clear the user's view, the spherical mirror is inclined with respect to the normal to his/her face and the user's eye is no longer on the axis of the mirror. This arrangement has a drawback of resulting in a collimated image that is affected by optical aberrations, especially off-centering aberrations, which need to be corrected, at least partially. The inclination of the spherical concave mirror afflicts the collimated image with distortion, known as off-centering distortion of the second kind, characterized by a convergence of the verticals and an apparent curvature of the horizontals."

Therefore, optical aberrations are not the same as the off-centering distortion of the second kind characterized by a convergence of the verticals and an apparent curvature of the horizontals.

In more detail, the spherical collimating mirror being observed at an oblique angle with respect to its axis, introduces an off-centering distortion of the second kind characterized by an absence of symmetry of revolution. This distortion is especially dangerous for a user piloting a vehicle, since the perception of the perspective is degraded (see page 4, lines 13-19). For example, Figure 2 represents the image perceived by an eye of the user of an optical device shown in Figure 1 in which the device of an image centered on the point 9 and including a square with a regular grid is collimated. The deformation perceived is an off-centering distortion of the second kind: the vertical lines which ought to be parallel straight lines are convergent and the horizontal lines which ought to be parallel straight lines occurred. This particular distortion is due to the inclination of the spherical collimating mirror with respect to the observation axis; it exhibits an absence of symmetry of revolution. When a pilot uses an optical device according to Figure 1 to steer his vehicle, he is greatly disturbed between the deformation between the image presented and the actual landscape. Heights are overestimated and speeds are underestimated (see page 9, lines 11-27).

Accordingly, to more clearly distinguish the claimed invention over the optical aberrations corrected in Wood, Claim 14 has been amended to recite that the distortion corrected by the diffractive field mirror is an off-centering distortion of the second kind corresponding to an absence of symmetry of revolution caused by the spherical concave mirror being viewed at an oblique angle with respect to an axis of the spherical concave mirror. This feature is supported in the specification at least at page 4, lines 13-17.

Accordingly, it is respectfully submitted independent Claim 14 and each of the claims depending therefrom patentably define over Wood.

Claims 17-19 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Wood in view of Chen et al.

Claims 17 and 19 depend on Claim 14, which as discussed above is believed to be allowable. Further, it is respectfully submitted Chen et al also do not teach or suggest the features recited in independent Claim 14. Therefore, it is respectfully requested this rejection also be withdrawn.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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OCT 16 2002

TECHNOLOGY CENTER 2800

Marked-Up Copy
Serial No: 09/806,936
Amendment Filed on:

10-16-02

IN THE CLAIMS

--14. (Twice Amended) An optical device for a helmet viewfinder presenting a collimated image to a user, comprising:

an imager and an off-axis spherical concave mirror; and

a diffractive field mirror for correcting distortion of an image presented to the user which is due to the off-axis spherical concave mirror,

wherein the distortion corrected by the diffractive field mirror is an off-centering distortion of the second kind corresponding to an absence of symmetry of revolution caused by the spherical concave mirror being viewed at an oblique angle with respect to an axis of the spherical concave mirror.--